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Chapter 18

US SPACE ORGANIZATIONS

Several organizations are responsible for DOD space operations. US Space Command is the overall head of an organization consisting of Air Force Space Command (14th Air Force), Army Space Command and Naval Space Command. This joint organization provides space support for unified commanders worldwide. In addition, space organizations provide warning data for the NORAD mission and theater ballistic missile defense units. Several national level organizations, such as the National Reconnaissance Office (NRO) are also involved in satellite operations. This chapter addresses the responsibilities of the various space organizations and includes an update on the new AFSPACE Aerospace Operations Center (AOC) at 14AF, Vandenberg AFB, CA.

UNITED STATES SPACE COMMAND (USSPACECOM)

History

US Space Command was created in 1985, but America's military actually began operating in space much earlier. With the Soviet Union's unexpected 1957 launch of the world's first man-made satellite, Sputnik I, President Eisenhower accelerated the nation's slowly emerging civil and military space efforts. The vital advantage that space could give either country during those dark days of the Cold War was evident in his somber words. "Space objectives relating to defense are those to which the highest priority attaches because they bear on our immediate safety," he said.

During the 1960s and 1970s, the Army, Navy and Air Force advanced and expanded space technologies in the areas of communication, meteorology, geodesy, navigation and reconnaissance. Space continued to support strategic deterrence by providing arms control and treaty verification, and by offering unambiguous, early warning of any missile attack on North America.

USSPACECOM **(Fig. 18-1)** is a *unified* command under the Department of Defense with headquarters at Peterson AFB, Colorado. USSPACECOM was activated on 23 Sep 1985 in order to form an organization to consolidate assets affecting US activities in space. The command is composed of the Air Force, Naval and Army Space Commands, and supports other US unified and specified military commanders. USSPACECOM's area of operation is the operational medium of space.

Fig. 18-1 USSPACECOM Emblem

Mission

The mission of USSPACECOM is to conduct joint space operations in accordance with its Unified Command Plan's assigned missions of Space Forces Support, Space Force Enhancement, Space Force Application and Space Force Control.

Space Forces Support

Space Forces Support includes launch and on-orbit satellite command and control operations provided by Army Space Command, Naval Space Command and 14th Air Force (Air Force Space Command). The 30th Space Wing at Vandenberg AFB, CA and the 45th Space Wing at Patrick AFB and Cape Canaveral, FL conduct space launch operations. Satellite tracking and operations are conducted by the 50th Space Wing at Schriever AFB, Colorado.

Space Force Enhancement

Space systems provide direct support to land, sea and air forces. To meet this requirement, USSPACECOM has control of a fleet of satellites that provide ballistic missile warning, communications, weather and navigation, precise positioning support, and intelligence, reconnaissance and surveillance (ISR). In addition, US forces employ commercial communications satellites, civil weather satellites and civilian Multi-Spectral Imagery (MSI) satellites.

Space Force Application

The Missile Defense Act of 1991, as amended by Congress in 1992, directs the DOD to provide protection of the US and forward deployed US forces, friends and allies from limited ballistic missile strikes.

Ballistic Missile Defense (BMD) systems are divided into theater defense systems to counter short, medium and intermediate range ballistic missiles. Future systems may also be developed to counter Intercontinental Ballistic Missiles (ICBMs).

USSPACECOM provides space-based ballistic missile support (warning, surveillance, cueing, etc.) to theater commanders for theater ballistic missile defense. The same support is also provided to NORAD for the protection of North America against ballistic missile threats.

Space Control

The Space Control mission is essential to the success of present and future US land, sea and air military operations. Assured access to, and unimpeded operations in space as well as the denial to an enemy of the same, are the key tenets of space control operations. This mission falls under the 21st Space Wing located at Peterson AFB.

The three pillars of space control are Surveillance, Protection and Negation.

The USSPACECOM worldwide Space Surveillance Network (SSN) is tasked to detect, track, identify and catalog all space objects to ensure space operations are conducted without interference.

The USSPACECOM Space Control Center (SCC) in Cheyenne Mountain provides warning to US space system operators in order to protect their satellites from potentially hostile situations or dangerous natural events.

Disrupting, degrading, denying or destroying space-based support to hostile military forces are the basic principles of negation. This could be accomplished by using conventional weapons to strike an adversary's space launch or ground relay facility.

The US does ***not*** have an operational anti-satellite (ASAT) weapon system. However, research and development into anti-satellite technology is continuing. An operational ASAT system would deter threat to US space systems, enabling the US to negate hostile space-related forces and ensure the right of self-defense.

In addition to the above missions, USSPACECOM is responsible for planning and executing ballistic missile defense of North America operations. USSPACECOM also advocates the space and missile warning requirements of the other CINCs.

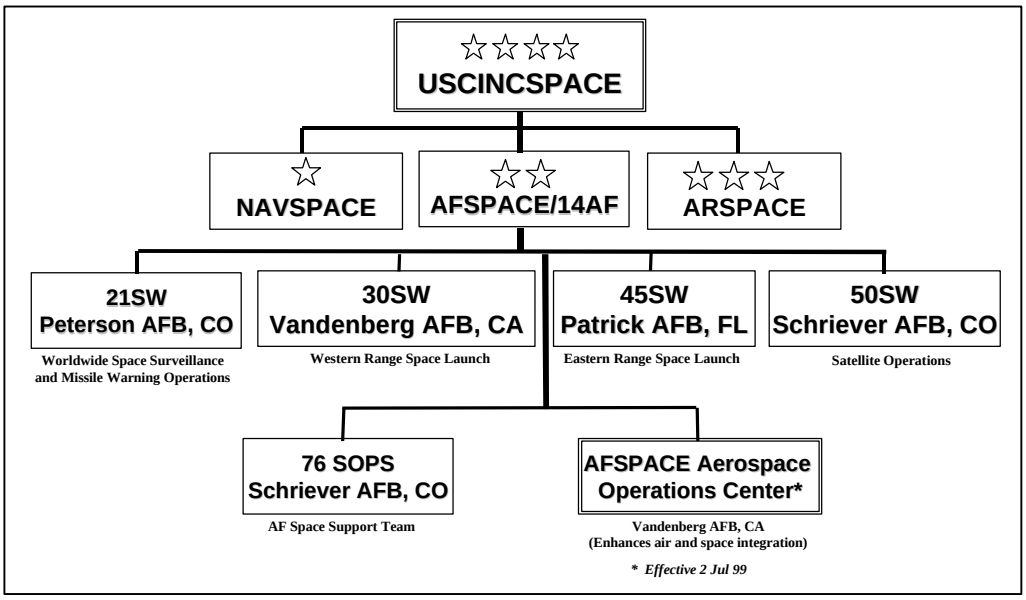

Fig. 18-2 USSPACECOM Organization

Organization

With headquarters at Peterson Air Force Base, USSPACECOM is made up of four service components with representation from the Air Force, Navy, Army and Marine Corps. The three component commands **(Fig. 18-2)** under USSPACECOM are Air Force Space Command, Naval Space Command and Army Space Command. Each of these commands will be discussed separately and in detail. Acting jointly, USSPACECOM personnel pull together several US military space assets previously operated and maintained separately by the services.

Responsibilities

As a result of the President's approved changes to the Unified Command Plan, operational command of US military space assets is similar to that of tanks, ships and aircraft.

The activation of the United States Space Command put the infrastructure in place that allows the DOD to consolidate and integrate DOD space forces into a single joint military organization, thus enhancing the deterrence capability of US space forces.

- The new command arrangement is directly responsible to the President, Secretary of Defense and Joint Chiefs of Staff.
- The Command provides positive, centralized control over space systems.
- The Command provides joint operational focus for requirements.

AIR FORCE SPACE COMMAND (AFSPC)

The AFSPC **(Fig. 18-3)** is a major command of the US Air Force and is the Air Force service component which supports the US SPACECOM mission through its functional component, the 14th Air Force.

Fig. 18-3 AFSPC Emblem

AFSPC is also a component of US Strategic Command (USSTRATCOM) for Inter-Continental Ballistic Missile (ICBM) forces; 20th Air Force at Warren AFB, WY provides the ICBM forces for AFSPC.

Background

During the 1960s and 1970s, Air Force operation of space systems was primarily the responsibility of Air Force Systems Command and the Strategic Air Command. As the number and type of space systems increased, and as US military forces became more dependent on the support they provided, the Air Force determined a single major command should be established to support and direct operational space activity.

Finally, the US Space Policy (announced in July 1982) stated that the most important goal of the US space program was to strengthen national security and maintain the US technological leadership in space.

AFSPC was established on 1 Sep 1982 to consolidate Air Force space activities and is responsible for operating assigned military space systems. AFSPC headquarters is located at Peterson AFB.

Mission

The mission of AFSPC is to defend the United States of America through the control and exploitation of space. AFSPC professionals are the best missile-space team in the world, making space reliable and routine for the warfighter by continuously improving the command's ability to provide and support combat forces.

As the service component of USSPACECOM, the primary focus of AFSPC is to increase the utility of space systems for the US and allied fighting forces. DESERT SHIELD and DESERT STORM provided the first sound foundation for space. Today's focus is to develop even more efficient and faster avenues for bringing space support to the warfighters

AFSPC provides the manning and day-to-day management of missile warning and space defense facilities. The command operates facilities and installations worldwide. This command consists of two numbered Air Forces, the 14th and 20th Air Force:

14th Air Force (14AF)

The 14th Air Force **(Fig. 18-4)**, located at Vandenberg AFB, California, plans and executes operations for space support, force enhancement and space control. It also serves as the operational component to USSPACECOM and recently established the new AFSPACE Aerospace Operations Center (AOC). The 14th Air Force provides the day-to-day operators and managers of AFSPC's space forces. 14AF is also responsible for AFSPC's operational planning and employment in wartime and during major worldwide exercises and contingencies.

Fig. 18-4 14th AF Emblem

The 14AF consists of the following subordinate units:

21st Space Wing**.** The 21st Space Wing was activated 1 January 1983 at Peterson AFB. It was the first operational space wing in the Air Force. The 21st Space Wing operates AFSPC's worldwide network of dedicated missile warning sensors. These sensors provide Integrated Tactical Warning and Attack Assessment (ITW/AA) of sea and land-launched ballistic missile attack against the continental US and Canada. Resources include the Defense Support Program (DSP), a space-based early warning system, phased-array radars and some mechanical radars. The Wing provides day-to-day management, training and evaluation for missile warning, intelligence and communications sites assigned to it.

The ITW/AA system detects, tracks and predicts the impact of intercontinental ballistic missiles and Sea-Launched Ballistic Missiles (SLBMs) targeted for the North American continent.

Included in the worldwide network are the PAVE PAWS SLBM warning system radars at Cape Cod AFS, Massachusetts and Beale AFB, California.

Ballistic Missile Early Warning Systems (BMEWS) are located at Thule AB, Greenland, Clear AFS, Alaska and Fylingdale's Moor in the U.K.

DSP ground stations are located in Colorado, Europe and Australia.

On 1 April 1991, the 30th and 45th Space Wings were activated to establish operational space wings at Vandenberg AFB and Patrick AFB, Florida, respectively. Reporting to these wings are Space Launch Squadrons (SLSs) for each respective DOD booster program. The SLSs plan, support and execute launches of DOD boosters.

Fig. 18-5. Titan IV launch

30th Space Wing**.** The 30th Space Wing at Vandenberg AFB, CA manages testing of space and missile systems for DOD and is responsible for launching expendable boosters for placing satellites into near-polar orbit from the west coast of the US The Wing launches Delta II, Titan II and IV (**Fig. 18-5**), and a variety of other expendable boosters.

In addition to operating the Western Test Range, the Wing provides launch operations and management of DOD space programs as well as launch and tracking facilities.

45th Space Wing. The 45th Space Wing at Patrick AFB, FL provides space launch and tracking facilities, safety procedures and test data to a wide variety of users.

The Wing launches a variety of expendable vehicles, including the Delta II, Atlas II and Titan IV. It also provides support to the space shuttle program. The Wing also operates Cape Canaveral AS, and the Eastern Range.

Additional responsibilities include the provision of launch operations and management of DOD space programs, and launch and tracking facilities for NASA, foreign governments, the European Space Agency and various private industry contractors.

50th Space Wing**.** The 50th Space Wing was activated 8 July 1985, at Schriever AFB. Its mission is to provide command and control of operational DOD satellite systems and to operate and manage the common user portion of the Air Force Satellite Control Network (AFSCN). The AFSCN is a worldwide network of eight satellite tracking stations linked by sophisticated communications equipment.

The eight Remote Tracking Stations are: Vandenberg Tracking Station, CA; Hawaii Tracking Station, HI; Colorado Tracking Station, CO; New Hampshire Tracking Station, NH; Thule Tracking Station, GN; Oakhanger Tracking Station, UK; Guam Tracking Station, GU; and the Diego Garcia Tracking Station, British Indian Ocean Territory (BIOT). This network supports more than 110 DOD satellites by allowing satellite operators at Onizuka AS and Schriever AFB to communicate with and control the satellites for which they are responsible.

The 750th Space Group (750 SG) was activated on 30 January 1992, a component of the 50th Space Wing, and is located at Onizuka AS, California (**Fig. 18-6**). This organization is responsible for operations, maintenance and logistics support for the common user resources of the AFSCN. The Group monitors, maintains and updates the status of AFSCN resources and provides the status of configurations and readiness of controlled

resources to multiple users and command centers.

Two Resource Control Complexes belonging to the 750 SG (21st SOPS at Onizuka AS and the 22nd SOPS at Schriever AFB) give the network dual node capability, ensuring continual support for on-orbit satellites. They are responsible for scheduling the use of tracking stations for satellite operators at Onizuka AS and Schriever AFB. This enables them to make contact through the tracking stations to communicate with the satellites for which they are responsible.

Due to the Base Realignment and Closure List, AFSPC operations at Onizuka AS will be transferring to Schriever AFB. This is expected to be completed by the year 2001.

The Space Operation Squadrons (SOPSs) under the 50th Space Wing at Schriever AFB perform tracking, telemetry and command functions for orbiting spacecraft. They are compatible with the SOPS located at Onizuka AS and provide support to the Defense Meteorological Satellite Program (DMSP), DSP, NAVSTAR Global Positioning System (GPS), Defense Satellite Communications System (DSCS), NATO III, the UHF Follow-On, MILSTAR and the Technology for Autonomous Operational Survivability (TAOS) experimental satellite.

Also located at Schriever AFB (**Fig. 18-7**) are the GPS Master Control Station (GPS MCS) operated by the 2nd SOPS; the MILSTAR Master Control Center operated by the 4th SOPS; and the 50th Space Wing Command Post.

Collocated on Schriever AFB are the dual Defense Satellite Communications Systems terminals, the Colorado Tracking Station of the AFSCN and a GPS monitor station.

Fig. 18-6. Onizuka AS

50th Space Wing subordinate units include the 1st through 7th SOPS:

- **1st SOPS** was activated on 30 January 1992 and is located at Schriever AFB. They provide routine, consolidated command and control support for three distinct systems: DSP, GPS, TAOS and other assigned Research and Development (R&D) spacecraft.

The 1st SOPS operates and maintains 24-hour AFSCN command and control capability for GPS and DSP systems. The squadron also operates and maintains R&D space systems possessing potential residual capabilities to support military forces.

Early orbit operations for GPS and DSP systems performed by the 1st SOPS include satellite activation, initial checkout and transfer to mission orbit. The squadron plans and executes Tracking, Telemetry and Commanding (TT&C) functions for GPS, DSP and assigned R&D satellites to maintain spacecraft state of health, sustain on-orbit operations and accomplish mission tasking. They also support satellite end-of-life testing and conduct satellite disposal operations for GPS, DSP and assigned R&D satellites as directed.

The 1st SOPS maintains DSP space-

Fig. 18-7. Schriever AFB, Colorado

craft positional knowledge to 200 meters and distributes data to worldwide users. The squadron maintains the capacity to support at least six contacts for each DSP satellite per day. When required, the squadron can relocate, within 48 hours, to

their back-up node at Onizuka AS to perform limited command and control to sustain on-orbit operations of assigned GPS and DSP satellites.

- **2nd SOPS** was also activated on 30 January 1992 and is located at Schriever AFB. They provide command and control for the GPS constellation of 24 satellites. GPS provides worldwide precision navigation service for US and allied military forces as well as a host of civilian users.

The 2nd SOPS operates and maintains the GPS MCS and a dedicated network of monitor stations and ground antennas to control and monitor the satellite constellation. The monitor stations passively track the navigation signals on all the satellites. Information is then processed at the MCS and is used to update the satellites' navigation messages. The MCS then sends updated navigation information to GPS satellites through ground antennas. Ground antennas are also used to transmit commands to satellites and to retrieve the satellites' state of health (SOH) information (telemetry).

- **3rd SOPS**, also located at Schriever AFB, was activated on 30 January 1992, along with 1, 2 and 4 SOPS. The 3rd SOPS conducts both launch and on-orbit operations for military communications satellites for the DOD and AFSPC.

The 3rd SOPS conducts launch and on-orbit operations for DOD communications satellites, which include the DSCS III, UHF F/O and MILSTAR. These satellites relay communications for the Defense Information Systems Agency (DISA) and Naval Space Command. These organizations manage and maintain all primary peacetime and wartime communications links for the National Command Authority (NCA), theater commanders and all strategic and tactical forces worldwide. The 3rd SOPS also has the AF Satellite Communications (AFSATCOM) mission. AFSATCOM provides reliable, enduring, worldwide command and control communications to users based on a priority system outlined by the Joint Chiefs of Staff (JCS).

Operational crews at the 3rd SOPS are responsible for providing telemetry analysis, tracking data for orbit determination and commanding of on-board subsystems for the DSCS III program. In addition, they are responsible for launch and early orbit operations for the Navy's UHF F/O spacecraft, a replacement for the Fleet Satellite (FLTSAT) Communications System.

The 3rd SOPS also shares with the 4th SOPS operational control of MILSTAR, a next generation communications satellite program. The 3rd SOPS was primarily responsible for launch and emergency operations, but all operational control of MILSTAR was turned over to the 4th SOPS in December 1996.

As the 3rd SOPS has been gaining control of new satellite systems, it has been working to focus its operations on these newest generation communications satellites. As a result, the operational mission for NATO III and DSCS II was transferred to the newly activated 5th SOPS at Onizuka AS. Control of the aging FLTSAT constellation was surrendered to the Navy at Pt. Mugu, California, in June of 1996.

- **4th SOPS,** located at Schriever AFB, was also activated on 30 January 1992, and is responsible for overall command and control of the MILSTAR satellite constellation.

The 4th SOPS is responsible for ensuring that the MILSTAR system provides survivable, enduring, minimum essential command and control communications through all levels of conflict for the NCA and warfighting Commanders-in-Chief worldwide. The 4th SOPS operates the $31 billion MILSTAR system, executing communications management, satellite command and control and ground segment maintenance for the MILSTAR constellation.

MILSTAR is the most advanced military communications satellite system to date. The multi-satellite constellation links command authorities to high priority US forces via MILSTAR terminals on aircraft, ships, submarines, trucks and ground sites through encrypted voice,

data, teletype or facsimile communications.

4th SOPS performs its functions through the MILSTAR Operations Center (MOC), Mobile Constellation Control Stations (CCSs) and the MILSTAR Support Facility (MSF).

The MOC personnel perform satellite command and control, communications resource management, systems engineering support, mission planning and anomaly resolution for the MILSTAR system. The MOC has two fixed CCSs which interface with the geographically distributed mobile CCSs to execute satellite command and control. The MSF controls maintenance and testing as well as hardware and software configuration control.

Communications resource management includes satellite communications channel apportionment and monitoring payload use; more specifically, planning, executing and monitoring payload use allocations from the NCA-level to tactical users in the field.

The 4th SOPS provides operators for the mobile CCSs located at the 721st Mobile Command and Control Squadron, Peterson AFB, and the 55th Operations Squadron, Offutt AFB, Nebraska. At higher readiness levels and during exercises, these personnel deploy with USCINCSPACE and USSTRATCOM respectively, to provide survivable, enduring and secure communications.

- **5th SOPS**, located at Onizuka AS, was activated on 22 November 1993 and is responsible for planning and conducting launch and on-orbit operations for a wide spectrum of vital DOD, allied and commercial space systems.

The 5th SOPS plans for and conducts launch and on-orbit operations for several DOD and allied space missions including Inertial Upper Stage (IUS) for NASA and DOD space assets, NATO Satellite Communications Systems and DSCS. In addition to satellite programs, the squadron provides tracking and telemetry support on every Space Shuttle mission and to several commercial launches.

5th SOPS has two primary responsibilities. The first is the launch and early orbit mission for all DSCS III satellites. This function is transferring to the 3rd SOPS in the very near future. The second primary function is the on-orbit command and control of the DSCS II military communications satellite constellation.

The 5th SOPS also controls the first five days of all NATO IV/SKYNET 4 satellites during launch and early orbit. In addition to this period, the squadron performs an active backup role to all NATO IV/SKYNET 4 on-orbit activities and is also responsible for daily operation of the one remaining NATO III satellite.

The IUS is used to take satellites from low Earth orbit to geosynchronous or inter-planetary trajectories.

The 5th SOPS also provides tracking, telemetry, and commanding support for NASA's National Oceanic Atmospheric Administration (NOAA), Geostationary Operational Environmental Satellite (GOES) and the Total Ozone Mapping Spectrometer-Earth Probe (TOMS-EP) satellites.

- **6th SOPS** had been located at Offutt AFB since its activation on 31 Jul 92 and was responsible for command and control of the DMSP satellites. On 11 Jun 98, it was deactivated when the DMSP operational mission was assumed by the NOAA Satellite Operations Control Center (SOCC) in Maryland which also controls the NOAA weather satellites.

The DMSP satellite constellation is designed to meet unique military requirements for worldwide weather information and to track existing weather systems over remote areas where ground weather information is not available. Data is relayed to the Air Weather Service's Air Force Weather Agency (AFWA) at Offutt AFB, and to the US Navy's Fleet Numerical Meteorological and Oceanographic Center (FNMOC) at Monterey, California. This is accomplished via common user AFSCN tracking stations at: Thule Air Base, GN; Kaena Point, HI; New Boston AS, NH; and the Vandenberg Tracking Station. The weather information is used to compile numerous worldwide weather products.

In May 1994, President Clinton directed the convergence of the DMSP program with NOAA's Polar-orbiting Environmental Satellite (POES) program. The POES program currently provides weather data to civilian and military users. As noted, DMSP operations has relocated to Suitland, Maryland, NOAA's satellite control center, in mid 1998.

- **7th SOPS**, located at Schriever AFB, was activated on 18 March 1993 and is the first Reserve unit assigned to AFSPC. The mission of this squadron is to augment space operation squadrons of the 50th Space Wing. These activities include: satellite emergencies, launch and early orbit, day-to-day routine operations and satellite disposal for the GPS and DSP satellites. In the future, the reserve personnel will support other programs.

76th Space Operations Squadron

The 76th Space Operations Squadron is located at Schriever AFB, CO and provides AF Space Support Teams (AFSSTs) for theater commanders worldwide. Unit members deploy in support of major military exercises and "real-world" contingency operations, including Bosnia, Korea and Iraq. The teams "enhance access to space" for warfighters by providing space system expertise, access to systems for space applications, and interface with other space organizations that can support theater-level operations.

AFSPACE Aerospace Operations Center (AFSPACE AOC)

In Aug 98, 14AF/CC established the new AFSPACE Space Operations Center (SOC) at Vandenberg AFB, CA. as the focal point for space support to the warfighter.

On 2 Jul 99, Maj Gen Hinson, the new 14AF commander, announced that the AFSPACE Space Operations Center's name would be changed to AFSPACE Aerospace Operations Center (AOC) to create common terminology, enhance air and space integration and highlight the close relationship between air and space assets.

The AFSPACE AOC provides COMAFSPACE with C4I infrastructure to plan, execute and exercise operational control of AFSPACE forces; supports USCINCSPACE and theater warfighters; is the focal point for employment of AFSPACE forces; and enables COMAFSPACE *to integrate spacepower into global military operations.*

The AFSPACE AOC is divided into a Strategy Division, a Combat Plans Division and a Combat Operations Division.

The Strategy Division focuses on long-range planning of space operations and includes developing, refining and disseminating the COMAFSPACE strategy for support to the warfighter.

The Combat Plans Division looks at near term space operations and determines how space systems can best be used to achieve joint military objectives. This division develops and disseminates the Space Tasking Order (STO) to all users.

The Combat Operations Division is the tasking agency for space units and includes the missile warning sensor sites as well as providing users with the products from these space units. The NORAD Command Post and Cheyenne Mountain Operations Center (CMOC) have agreed to turn over this function to the AFSPACE AOC when it becomes fully operational in 2002.

In summary, the AFSPACE AOC has control and operational tasking of space units through the Space Operations Team to support joint military operations and executes that support through the Space Tasking Order. The AOC has the ability to adjust the STO to respond to operational dynamics in a wartime or crisis situation, something not available until now.

20th Air Force

"America's ICBM Team deterring conflict with professional people and ready, secure missiles."

That's the 20th Air Force mission statement. ICBMs will continue to be the

backbone of America's Strategic deterrent force well into the 21st century, as they are the only on-alert strategic force available to the Air Force. With a readiness rate above 99 percent, they are the nation's fast-reaction, long-range force, deterring any adversary from launching a preemptive attack against the US

Fig. 18-8. Minuteman ripple launch

Deterring an attack against the US by weapons of mass destruction (nuclear, biological or chemical) remains America's highest defense priority. In today's rapidly changing world, a quick-response deterrent nuclear capability is essential **(Fig 18-8)**. As more countries strive to develop weapons of mass destruction and sophisticated delivery systems, ICBMs serve as an insurance policy for the US and the world against rogue nations and terrorists.

Space Warfare Center (SWC)

The SWC **(Fig. 18-9)** was established at Schriever AFB on 8 December 1993 and forms a nucleus of operators and space personnel to develop space support systems and provide assistance to warfighters.

Fig. 18-9 SWC Emblem

The SWC performs operational testing and develops tactics for space-related systems; works with theater commanders on integration of space systems into exercises and war plans; and develops concepts and prototypes for employing emerging technology for advanced space systems and missions. Among its initiatives is Project Hook, a combination of GPS navigation and survival radios designed to improve search and rescue operations for downed pilots. Project Hook essentially takes the "search" out of "search and rescue" by pinpointing the location of the pilot on the ground and relaying it via "burst transmission" to a Search and Rescue Center and airborne rescue forces.

Another SWC initiative, the Multi-Source Tactical System (MSTS), provides a six-layered picture of the operational theater for aircrews. It combines tactical, intelligence and digital mapping information with near real-time Airborne Warning and Control System (AWACS) information to update flight crews en route to their targets or drop zones. Overall, there are more than 30 initiatives currently underway in the SWC to improve the tactical use of space by warfighters.

The SWC is developing space models and simulations for inclusion in wargaming centers around the world, that are operated by all the services. They are developing, through their Forward Space Support in Theater (FAST) teams, operational plans for theater commanders that provide access to space assets and training in their use. Finally, the center is de-

veloping courses to teach space operators how to wage war so they can better understand and plan for space support to warfighting efforts.

NAVAL SPACE COMMAND (NAVSPACECOM)

The naval service's growing dependence on space prompted the Secretary of the Navy to establish a new command which would consolidate space activities and organizations that operate and maintain naval space systems. This new organization, the Naval Space Command (NAVSPACECOM) **(Fig. 18-10)**, was commissioned on 1 October 1983. It was a decisive move to bring together several activities under a single command. The new command strengthens operational control, provides a central focal point for naval space matters and more effectively guides future operational uses of space.

Fig. 18-10 NAVSPACECOM Emblem

NAVSPACECOM headquarters is located at the Naval Surface Warfare Center, Dahlgren Division (NSWCDD), at Dahlgren, Virginia. The Dahlgren Division now includes a Dahlgren headquarters site with detachments or operating facilities at White Oak, Maryland, Wallops Island, Virginia and Naval Coastal Systems Center, Panama City, Florida. When NAVSPACECOM was established, NSWCDD already served as host for two other major tenant activities; the AEGIS Training Center and the Naval Space Surveillance Center (NAVSPASUR).

A major advantage to locating NAVSPACECOM at Dahlgren was the fact that NAVSPASUR was already located there and had in place, the necessary communications to other space-related command centers.

Mission

NAVSPACECOM uses the medium of space and its potential to provide essential information and capabilities to ashore and afloat naval forces by:

- Operating surveillance, navigation, communication, environmental and information systems;
- Advocating naval warfighting requirements in the joint arena; and
- Advising, supporting and assisting naval services through training and by developing space plans, programs, budgets, policies, concepts and doctrine.

For additional information on the Naval Space Command and Navy space operations, see SRG Chapter 22: **Space Operations and Tactical Applications - US Navy.**

US ARMY SPACE AND MISSILE DEFENSE COMMAND (SMDC)

The Army Space and Strategic Defense Command (SSDC) was created in 1992 to unite key Army space organizations under a Lieutenant General. This command was a combination of two former Army commands, the Army Space Command (ARSPACE), located in Colorado Springs and the Strategic Defense Command in Huntsville, Alabama. Since 1992, additional Army space-related elements have been added: the Army Space Program Office (ASPO), which runs the Army TENCAP program; and the Army Space Technology Office (now called the Army Space Technology Program), which guides Army R&D activities.

In October 1997, Army SSDC was renamed Army Space and Missile Defense Command (SMDC). The headquarters for SMDC is in Arlington, Virginia reporting directly to the Army's Deputy Chief of Staff for Operations (DCSOPS).

Mission

US Army SMDC activities in Huntsville trace their lineage to Werner von Braun and the Redstone Arsenal space activities of the 1950s. Today, SMDC maintains a place within DOD as a superior research facility supporting not only Army initiatives, but the Ballistic Missile Defense Organization, the Advanced Research Program Agency (ARPA) and matrix support to a myriad of other DOD research and applications initiatives. SMDC at Huntsville is organized into two main centers: the Missile Defense and Battlefield Integration Center supporting modeling and simulation activities; and the Missile Defense and Space Technology Center focusing on space and strategic defense-oriented research and development.

Primary functions of SMDC include:

- Operation of the Advanced Research Center (ARC), a government-owned, contractor-operated research center for BMD activities. ARC is part of the National Testbed and works with the Joint National Test Facility (JNTF) at Schriever AFB.
- Operation and maintenance (O&M) of the High Energy Laser System Test Facility (HELSTF) at White Sands Missile Range, New Mexico.
- Development of technologies associated with Army space capabilities.

SMDC Organizations

For additional detailed information on Army space, see SRG Chapter 23: **Space Operations and Tactical Applications - US Army.**

NORTH AMERICAN AEROSPACE DEFENSE COMMAND (NORAD)

The North American Aerospace Defense Command (NORAD) **(Fig. 18-11)** is the US-Canadian command for the strategic aerospace defense of the North American continent. The Commander-in-Chief (CINC) of NORAD (CINC-NORAD) also serves as the CINC, United States Space Command (USCINC-SPACE), and Commander, Air Force Space Command (AFSPC/CC).

Fig. 18-11
NORAD Emblem

These three commands, which over-lap in terms of their resources and operational responsibilities, have their headquarters in Colorado Springs. The Space Commands provide resources and data for the NORAD mission.

Background

Strategic aerospace defense traces its roots to the Air Defense Command, which was formed in 1946 at Mitchell Field, New York. The designated mission for that command was to defend the United States against a manned bomber attack. In 1957, the United States and Canada jointly assumed responsibility for the strategic aerospace defense mission with the establishment of NORAD. Over time, the warning and assessment mission expanded to include ballistic missiles. This evolution was formally recognized in the 1981 NORAD Agreement when the name was changed from "Air" to North American "Aerospace" Defense Command.

Mission

The two primary missions established for NORAD, as stated in the 1996 NORAD Agreement, are:

- Aerospace warning for North America
- Aerospace control for North America

Aerospace warning includes the monitoring of man-made objects in space and the detection, validation and warning of attack against North America; whether by aircraft, missiles or space vehicles, utilizing mutual support arrangements with other commands. Aerospace control includes providing surveillance and control of the airspace of Canada and the United States.

CINCNORAD and the Deputy cannot be from the same country, and their appointments must be approved by the Canadian and United States Governments. During the absence of CINCNORAD, command shall pass to the Deputy CINCNORAD. Canadian forces and members of the United States Air Force, Army, Navy and Marine Corps occupy key NORAD positions. There are no Army or Naval components dedicated to North American Air Defense, but the Navy and US Marine Corps would augment NORAD and USSPACECOM with resources during air defense contingencies. The Navy and Army provide space surveillance resources that are responsive to NORAD. During heightened defense conditions, CINCNORAD could have more than 50,000 people under operational command.

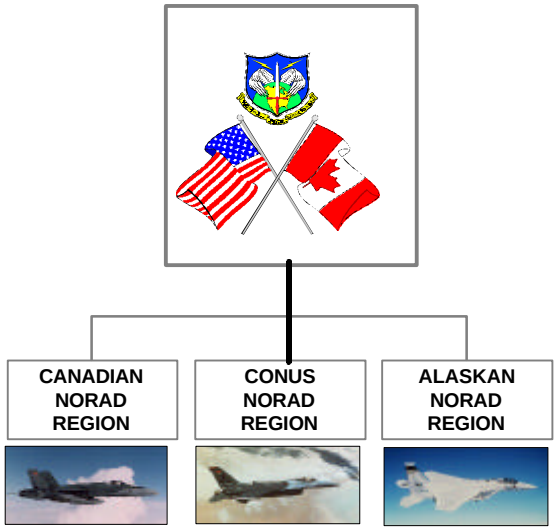

Fig. 18-12 NORAD Organization Chart

Organization

NORAD provides cooperative defense planning between the governments of Canada and the United States and places strategic defensive forces under a single Commander-in-Chief.

CINCNORAD, and the Deputy CINCNORAD, are responsible to the Canadian and United States Governments through the Chief of the Defense staff of Canada and the Chairman of the Joint Chiefs of Staff of the United States.

NORAD forces (**Fig. 18-12)** are supplied by Canadian Forces Air Command; AFSPC (with supporting forces from 14th Air Force in and 20th Air Force); Air Combat Command (ACC), 11th Air Force in Alaska; Air Force Communications Command (AFCC); the Air National Guard; Air Force Reserve; and by the US Army, Navy and Marine Corps.

Canadian Forces Air Command provides fighter interceptors, radar stations and control centers. Air Combat Command's 1st Air Force at Tyndall AFB,

Florida is responsible for management of air defense resources in the Continental United States (CONUS), such as fighter interceptors, radar sites and control centers. The 11th Air Force at Elmendorf AFB, Alaska operates the air defense units in Alaska. Other interceptors are provided by the Air National Guard, US Navy and Marine Corps.

AFSPC provides the missile warning and space surveillance sensors that report information to NORAD and other users.

Tasks

The increasingly versatile strategic threat provides the enemy planners many more options for a coordinated attack designed to confuse and delay a coordinated response. An integrated warning and assessment capability is essential for protection against an orchestrated enemy attack.

Aerospace Warning

NORAD's most important task is to warn of a missile attack against North America. To accomplish the aerospace warning mission, CINCNORAD is responsible for providing Integrated Tactical Warning and Attack Assessment (ITW/AA) of an aerospace attack on North America to the governments of Canada and the US This is accomplished by using information made available by the ITW/AA system. Portions of that system are under the operational control of CINCNORAD, while other portions are operated by commands supporting NORAD. For example, ground based radars located throughout Canada and the US to detect air-breathing threats are under operational control of CINCNORAD, while missile warning and space surveillance are provided by USSPACECOM.

CINCNORAD maintains his headquarters at Peterson AFB, and at a command and control center at Cheyenne Mountain Air Station (CMAS), which is a short distance away. The CMAS serves as a central collection and coordination facility for a worldwide system of sensors designed to provide the CINC and the NCA of the US and Canada with an accurate picture of any aerospace threat to their respective areas of responsibility.

CINCNORAD uses information from missile warning systems. This means that he assesses hundreds of missile launches worldwide per year to determine if they are a threat to North America. The CINC provides an assessment to the national leadership of both Canada and the United States on whether North America is under attack..

As the ITW/AA system executive manager, CINCNORAD is responsible for the technical integrity of the missile warning system. The NORAD/J3 and USSPACECOM/J3 are Co-functional managers of the ITW/AA system, charged with carrying out the CINC's charter. All proposed changes to the ITW/AA system are reviewed and validated through a controlled board process. The details of the process can be found in two documents, System Management for the Integrity of the ITW/AA System, NUPD 10-25 and Configuration Control Process, AFSPC Instruction 21-104.

Threat. Since the mid-1970s, despite SALT and START, the USSR, now Russia, has upgraded its ICBM force through improved on-alert rates, reliability, range, payload, accuracy, and survivability. The new missiles are, for the most part, equipped with Multiple Independently Targetable Reentry Vehicles (MIRVs). Together, this force has the capability to destroy a large percentage of US ICBMs using only part of their total inventory. The latest round of negotiations (START II) promises to eliminate MIRVs and to reduce the land-base inventories of both sides. In addition, Russia continues to expand and modernize its SLBM force. Its current Delta and Typhoon class nuclear powered fleet ballistic missile submarines permit Russia to strike targets in NATO, Europe, North America and Asia from their home ports.

Current Capability. In the face of the missile threat, NORAD must provide timely, reliable and unambiguous warning. The warning is done by surveillance of

potential enemy launch areas or flight corridors with infrared and radar sensors. The use of two different sensor types to confirm an event is called dual phenomenology. Infrared sensing satellites detect a launch, while radar systems pick up the missile shortly thereafter. The radar systems track the missile and provide impact predictions.

Following initial detection by an early warning satellite, confirmation of an ICBM or SLBM launch from northern waters is made by one of the three Ballistic Missile Early Warning System (BMEWS) radar sites located in Alaska, Greenland and the United Kingdom **(Fig. 18-13)**.

Fig. 18-13 BMEWS, Clear AFS, Alaska

The command employs a system of high-speed, phased-array radars called PAVE PAWS. These radars, at Cape Cod AFS and Beale AFB, provide coverage to a range 3,000 nautical miles. To cover northern launch areas behind BMEWS, NORAD uses the Perimeter Acquisition Radar Attack Characterization System (PARCS) at Cavalier AFS, North Dakota. This phased-array radar was originally built as part of the Army Safeguard Anti-ballistic Missile System and was redesignated as an Air Force missile warning radar in 1977.

To support a capability for massive retaliation, most of the sensors were originally designed to detect a raid and simply indicate incoming missiles. The BMEWS radars could do so by detecting and tracking the large missile fuel tanks. In the late 1970s, Soviet ICBMs, through increased accuracy and multiple warhead systems, acquired the capability to threaten US ICBMs in their silos. As a counter, NORAD's responsibility was increased to not only report missile encroachment, but also to provide an assessment by informing the NCA of the missiles intended targets.

Aerospace Control

In March 1981, the United States and Canada redefined NORAD's aerospace control mission. The new definition recognized the continued upgrading of Soviet bomber capabilities and emphasized the need for providing reliable atmospheric early warning.

The aerospace control mission of NORAD includes detecting and responding to any air-breathing threat to North America. To accomplish this mission, NORAD utilizes a network of ground based radars and fighters to detect, intercept and, if necessary, engage the threat. These fighters consist of US F-15s and F-16s and Canadian CF-18s.

As a part of its aerospace control mission, NORAD assists in the detection and monitoring of aircraft suspected of illegal drug trafficking. This information is passed to civilian law enforcement agencies to help combat the flow of illegal drugs into North America.

In 1989, the US government decided to attack the drug problem along three lines: countering the production of illegal drugs at their source; detecting and stopping their transit into North America; and reducing distribution and use throughout the US In 1991, NORAD was tasked with carrying out the second line of defense, the detection and monitoring of the aerial drug smuggling threat into North America.

The US government consulted with the Canadian government on the counter drug mission and Canada fully concurred with proposed NORAD drug interdiction efforts. In cooperation with US drug law enforcement agencies and the Royal Canadian Mounted Police (RCMP), the Canadian NORAD Region (CANR) is responsible for monitoring all air traffic approaching the coast of Canada. Any aircraft that has not filed a flight plan may

be directed by Canadian NORAD assets to land and be inspected by the RCMP and Customs Canada.

Threat. Russia has bombers that can reach North America with air-to-surface missiles, gravity bombs and air launched cruise missiles. They also have Backfire bombers and have developed a Blackjack bomber, similar to the US B-1 bomber. Russia is also producing a cruise missile and is developing four other versions. Three of these are similar to the US long-range Tomahawk and can be launched from air, land and sea platforms. The other two versions are larger cruise missiles which have no counterpart in the US inventory. The cruise missile threat will take on more importance as more of these missiles are deployed on aircraft and submarines off North American coasts. The Blackjack can carry these missiles, as can a variant of the Bear (the Bear H), which is now deployed as a cruise missile carrier.

Current Capability. In the early 1960s, NORAD had an extensive air defense capability, thousands of interceptors, radars and surface-to-air missiles. Since then, this equipment has been significantly reduced. Further, the current Distant Early Warning (DEW) Line was built in the 1950s to provide a tripwire warning capability. It consists of a 3,000-mile long 200-mile wide network of 50 radars along the Arctic Circle from Alaska eastward to Greenland; however, it is has become increasingly expensive to operate and maintain.

Airborne radar coverage is provided by the E-3 Airborne Warning and Control System (AWACS) aircraft on an as-required basis. Canada contributes military personnel to AWACS operations. The USAF AWACS assets provide a quantum leap improvement over ground-based radars and augment the perimeter radar system in times of increased alert. AWACS aircraft can detect targets out to ranges of about 350 miles, and guide Canadian or US interceptors to those targets.

In 1983, NORAD modernized its airspace control capability by closing the old region control centers and replacing the Semi-Automatic Ground Environment (SAGE) computer system with Region Operations Control Centers (ROCCs). The ROCC has recently been changed and is now called the Region Air Operations Center (RAOC). Three subordinate region headquarters, located at Elmendorf AFB (Alaskan NORAD Region, ANR), Canadian Forces Base Winnipeg, Manitoba (CANR), and Tyndall AFB (CONUS NORAD Region, CONR), receive direction from the CINCNORAD and control air operations within their respective areas of responsibility. There are three Sector Air Operation Centers (SAOCs) in the CONUS region: two collocated SAOCs cover the Canadian region, while a third provides coverage of Alaska. These SAOCs provide decentralized management for airspace surveillance while funneling all air defense information to computers inside Cheyenne Mountain for assessment by CINCNORAD. Replacement of the SAGE system with RAOCs resulted in a savings of about $140 million a year.

The first air defense priority is to deploy an atmospheric early warning system around North America to complement the missile warning capability.

System Improvements

The Over-The-Horizon Backscatter (OTH-B) radar provided NORAD with a long range missile detection capability. Two systems were built, one on the west coast and one on the east coast. Both systems were successfully tested but with the decline of the USSR in 1989, it was determined that only the east coast system would become operational. The west coast system was put into storage with a regeneration time of 18 months to 2 years. The east coast system did come on line and was operational for a number of years. In 1995, the east coast system was shut down and put into storage with a regeneration time of 18 months to 2 years.

To the north, a modernized DEW Line, the North Warning System (NWS), con-

sists of minimally attended long-range and unattended gapfiller radars to provide an all-altitude bomber detection capability. The 13 military radars in Alaska were replaced by minimally attended radars, called SEEK IGLOO, which will reduce maintenance and personnel costs. The NWS/SEEK IGLOO upgrade plays a major role in providing long range bomber and cruise missile detection.

Space-based radar is a possible future option being considered jointly by the Air Force and Navy. The space-based radar has the potential for meeting both fleet defense and NORAD needs.

The important point is that an early-warning system will deprive the enemy of having a no-warning atmospheric attack option. An atmospheric early-warning system will also permit a more effective employment of the limited number of E-3 AWACS aircraft and interceptors.

Space Surveillance

USSPACECOM provides NORAD with both surveillance of space activities of strategic or tactical interest and warning of space events that may threaten North America.

Task Integration

CINCNORAD exercises operational control of widespread forces supporting NORAD tasks from a combined command center inside Cheyenne Mountain near Colorado Springs. CMAS, built inside a network of tunnels, consists of interconnected steel buildings resting on anti-shock springs. The facility operates 24-hours a day, 365 days a year. The NORAD communications and computer systems form the largest and most complex command and control network in the free world. The mission of CMAS is to provide CINCNORAD and the military as well as national leadership, with an integrated picture of the threat. This includes potentially hostile missile, air and space activities.

NORAD 2010 and Beyond

NORAD has developed concepts to meet the challenges of the 21st century. These include:

- **Precision Tracking.** Required to detect and track any air or space threat to North America from its origin because NORAD must know exactly where a threat is to precisely engage.

- **Precision Engagement.** Provides NORAD the capability to precisely engage threats throughout the full range of our surveillance coverage to ensure off-shore threat engagement well before air and space weapons threaten Canada or the US. This requires agile platforms with lethal munitions to engage targets more responsively and accurately from longer distances and precise, immediate operational assessments with the agility to re-engage if required. This system will include a flexible, near real-time targeting architecture, including space-based wide area surveillance, rapid identification, tracking, and near real-time sensor to shooter links.

- **Integrated Battle Management.** A system of systems providing seamless battle management from NORAD regions to receive and give effective support to our forces during peacetime and wartime.

- **Focused Logistics.** NORAD will require an agile and responsive logistics system in 2010 to support rapid crisis response. This system will fuse information, logistics and transportation technologies to deliver tailored logistics packages and sustainment when and where needed.

- **Information Superiority and Technological Innovation.** Information superiority is the ability to collect,

process, and disseminate an uninterrupted flow of information while exploiting or denying an adversary the ability to do the same. A system of systems linking networks of sensors, command and control, and shooters will allow NORAD to use "network centric warfare" to increase our joint/combined combat power.

TOC

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